REMARKS

Claims 8-12 were pending in the application. In the Office Action mailed April 17, 2009, claims 8-12 are rejected. In the instant Amendment, claims 8-9 and 12 have been cancelled, without prejudice, and claims 10-11 have been amended. Upon entry of the instant Amendment, claims 10-11 will be pending in the application.

Claim 10 has been amended to recite that the ultralow carbon cold-rolled steel sheet is annealed. Support for the amendment is found in the specification, e.g., at p. 12, ll. 24-25. Claim 10 has also been amended to have proper antecedent basis.

Claim 11 has been amended to depend on claim 10, and to recite that the ultralow carbon cold-rolled annealed steel sheet contains no added B. Support for the amendment is found in the specification, e.g., at p. 11, ll. 28-30, and p. 16, Table 1, Steel No. 1.

The amendments are proper in that they place the application in condition for allowance or in better form for appeal. No new matter has been added by these amendments.

Rejection under 35 U.S.C. § 112, second paragraph

Claims 11 and 12 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regard as the invention because they depend on canceled claims 1-3. Claim 12 has been cancelled rendering the rejection moot. Applicants have amended claim 11 to properly depend on claim 10. The rejection is therefore obviated.

Rejection under 35 U.S.C. § 103

Claims 8-12 are rejected under 35 U.S.C. § 103(a) as being unpatentable over JP 06-065647 ("JP '647") in view of JP 2003-268435 ("JP '435"). Claims 8-9 and 12 have been canceled.

The Examiner is of the opinion that JP '647 discloses a cold rolled steel sheet having an alloy composition which overlaps that of the steel sheet presently claimed for some alloy elements. Although the Examiner acknowledges that JP '647 does not teach addition of La, Ce, and Nd, the Examiner states that JP '435 teaches the use of Nd to dissolve TiO, and it would have been obvious to one of ordinary skill in the art to add 0.0001-0.01 wt% of Nd to

the composition of JP '647 to decompose the small amount of dissolved oxygen and TiOn inclusions.

The present invention is directed to an ultralow carbon steel sheet free of press cracking and surface deterioration due to inclusions. Applicants have discovered that such a steel can be achieved by including in the steel a critical amount of acid soluble Ti for fixing C and N and deoxidizing the molten steel, and a suitable amount of La, Ce, and/or Nd for preventing Ti based precipitates and fixing S (see, the specification at p. 8, ll. 21-32; p. 8, l. 37 through p. 9, l. 9; and p. 10, l. 34 through p. 11, l. 17). The acid soluble Al concentration is reduced to below 0.003%, thereby avoiding the production of a large amount of alumina clusters which cause surface defects and cracks (see, the specification at p. 9, ll. 10-19). Applicants also discovered that in order for S to be sufficiently fixed, S concentration must be kept below 0.01% (see, the specification at p. 17-22). The steel of the present invention exhibiting a high r value (r value$\geq$ 2.0) and elongation (total elongation $\geq$ 50%), and enabling good steelmaking operations (see, the specification as filed, e.g., the paragraph bridging pp. 3-4).

Regarding the amount of Ti, applicants have discovered that Ti must be added in an amount required for both deoxidation of the molten steel and fixing the C and N (see, the specification at p. 10, l. 35 through p. 11, l. 10). However, the amount of Ti must be limited such that the added La, Ce, and Nd are capable of preventing TiS precipitation. Specifically, if the acid soluble Ti concentration exceeds 0.07%, or if S is present in amounts greater than 0.01%, fine TiS ends up precipitating even with the addition of La, Ce, and Nd (see, the specification at p. 11, ll. 10-12). However, if the acid soluble Ti concentration is less than 0.01%, the C and N are not sufficiently fixed and the steel quality degrades (see, the specification at p. p. 11, ll. 12-15). Applicants have shown that the critical range of Ti, in conjunction with the amount of S, and La, Ce, and Nd of the present invention, leads to the achievement of the claimed ultra low carbon steels having excellent surface qualities and workablilty.

On the contrary, JP '647 teaches a Ti range from 0.02 to 0.1%, and sulfur less than 0.05%. These ranges are overly broad and encompass compositions that, even with added La, Ce, and Nd, would cause the precipitation of fine TiS and the concomitant issues with nozzle clogging and high temperature annealing, etc., in a similar fashion as the

conventional steel sheets. There is no teaching or suggestion to constrain the amount of Ti to be within the claimed range, not to limit the amount of sulfur or aluminum.

The Abstract of the JP '435 reference teaches that

> ... for manufacturing the low-carbon thin steel sheet, ≥0.005 mass% Ti is added for deoxidation to molten steel whose carbon concentration is adjusted to ≤0.01 mass%, and Nd is further added before casting the molten steel. Here, the amount of Nd added is no less than an amount required for reductive decomposition of small amounts of dissolved oxygen and TiOn inclusion left after Ti deoxidation but no more than an amount contaminating the molten steel by reacting with refractories or mold powders. An appropriate range of Nd concentration in the molten steel is 0.0001-0.01 mass%

Thus, JP '435 teaches adding Ti in any amount exceeding 0.005% for deoxidation, and Nd of 0.0001-0.01% for decomposition of small amounts of dissolved oxygen and TiOn. JP '435 does not teach or suggest adding Ti in an amount sufficient for both deoxidation and fixing C and N. The only exemplified amount of Ti is 0.01%, an amount insufficient to deoxidize and fix C and N according to the presently claimed invention. JP '435 teaches that Nd is used in an amount sufficient for its Ti amount, e.g., 0.0001-0.01%, which, as discussed above, is insufficient to deoxidize and fix C and N. JP '435 does not teach or suggest the amount of Nd required for decomposition of oxygen and TiOn if Ti amount is more than 0.01%, much less to limit Ti to ensure the added La, Ce and Nd is sufficient preventing Ti based precipitates and fixing S. Therefore, JP '435 does not teach or suggest controlling the amounts of Ti, Al, S as well as La, Ce, and Nd as in the claimed steel.

Thus, based on the teachings of JP '435 and JP '647, a person skilled in the art would not have expected or predicted that in order to achieve the presently claimed ultralow carbon steel sheet free of press cracking and surface deterioration due to inclusions, exhibiting a high r value (r value≥ 2.0) and elongation (total elongation ≥ 50%), and enabling good steelmaking operations without nozzle clogging, the ranges of Ti, Al, and S, and La, Ce, and Nd must be controlled within the recited ranges.

In addition, Applicants have amended claim 11 to exclude added B. In contrast, JP '647 teaches that "B must be added to improve secondary workability. If the B addition is less that 0.0001%, there is no effect of the B addition, and if the B addition exceeds 0.001%, r value for deep drawability is deteriorated by the worse effect of solute B."

See, JP '647 paragraph [0007]. Thus, based on the teachings of JP '647, a person skilled in the art would not have expected that a steel sheet containing no added B would be desirable. JP '435 does not teach or suggest the effect of B in a steel composition. Therefore, JP '435 does not teach or suggest modifying the steel of JP '647 by removing B.

Therefore, Applicants respectfully submit that claims 10-11 are not obvious under 35 U.S.C. § 103(a) over JP '647 and JP '435, either alone or in combination.

It is submitted that in view of the present amendment and foregoing remarks, the application is now in condition for allowance. It is therefore respectfully requested that the application, as amended, be allowed and passed for issue.

Respectfully submitted,

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